Warfighting Innovation in the Pacific

Marine Corps Forces Pacific
Experimentation Center (MEC)

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Marine Corps Forces Pacific Experimentation Center (MEC)

Mission: *To serve as a focal point for MFP transformation and experimentation throughout the Pacific and Central theaters*

Provide operational tests, experimentation and military utility assessments in support of MFP technology insertion opportunities

Services:

- *One Stop Shopping: Provide venue, tool sets and coordination planning for operational testing, experiments, demonstrations and assessments in the MFP AOR*
- *Strategic Alliance: Integrate Joint, Coalition, S&T community and industry efforts*

Operating Philosophy:

- *Warfighter pull – Efforts based on MFP and PACOM warfighter requirements*
- *Create partnerships between the S&T community and our operational forces*
- *Get advanced technologies in the hands of operators early for operational assessments*
- *Experiment as we exercise and operate*
- *Act as honest broker – no technology bias*
- *Minimal impact on operational forces*

Help the S&T Community Help

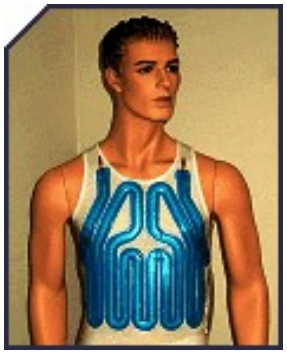
Gov't scientists and engineers, and

Past MEC Efforts

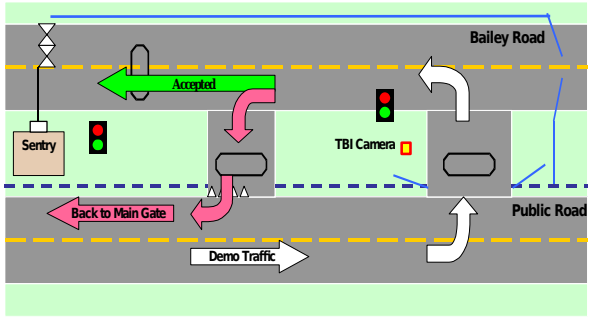
D-Day Mobile Fuel Distribution

Gladiator

Vestlights



Koolvest



S-GATE

Digital Intelligent Situati
Mapping (DISM)

Common Logistics C2 System
(CLC2S)

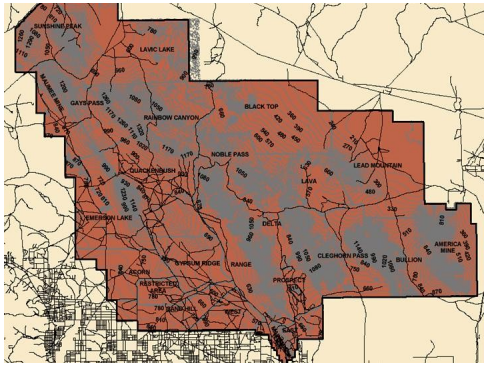
Joint Oil Analysi
Program (JOAP)

Current MEC Efforts

Machine Language Translation

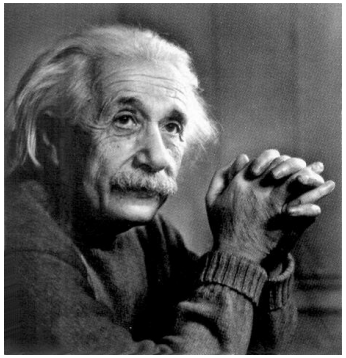
Gunslinger

Total Asset Visibility



Joint Robotics Integration Facilities

Mobile Modular Command and Control (M2C2)



Project Albert

Sense and Respond

PAVEMEND

CURRENT PACOM OBJECTIVES

'Last Tactical Mile' (sealift meter)

TACTICAL REQUIREMENTS

- **SHALLOW WATER BEACH ACCESS**
- **INLAND WATER WAY ACCESS**
- **INLAND WATER WAY BRIDGING**
- **COASTAL / TIDAL CAUSEWAYS**
  - **MARSH LANDS**
  - **ESTUARIES**
  - **UNIMPROVED PORTS**
  - **DIMINISHED PORTS**
  - **DIMINISHED BEACH ACCESS**

Existing Capability Plans

Joint High Speed Vessels

'…JHSVs will provide the capability … that can immediately **transition to execution, even in the absence of developed infrastructure**…' *Joint Operations Concepts,* Department of Defense, November 2003, para 3.A.4

Draft JHSV ICD, 30 Nov 2004

1. 'JHSVs will serve as flexible, **responsive links** between advanced bases, dispersed nodes of the sea base, ports and **austere littoral access points** for Joint Forces operating ashore and afloat.'

2. 'JHSVs provide a **platform for the projection**, employment, and sustainment of special operations forces, **independent of host-nation infrastructure**. The JHSV's high-speed will enable the rapid delivery of SOF to insertion points. High-speed combined with shallow draft will allow embarked special operations forces to **transit in the afloat**

BRIDGING THE GAP

?

?

ACCESS?

?

No existing tactical mobile asset can access nor traverse these terrains.

No existing tactical asset can be rapidly employed with the limited logistics support to effectively bridge these terrains in a time effective manner.

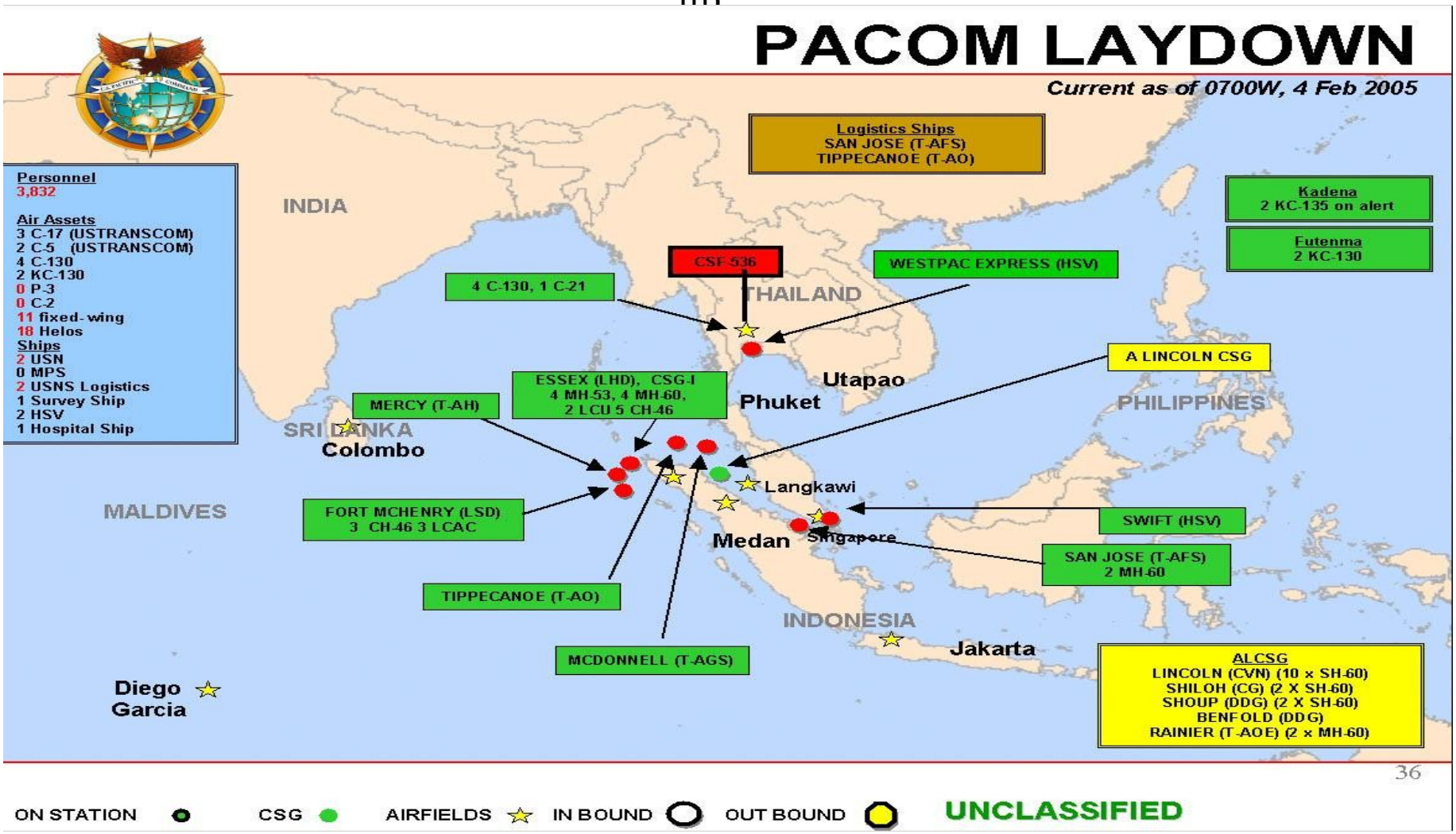
The common tactical factor of an existing estuary, mudflat, or inland basin and a flooded occurrence due to natural disaster:

Expeditionary Warfare or Humanitarian Aid

Capability gaps continue to restrict Littoral Distribution

Brigadier General Jan-Marc Jouas, USAF Combined Support Force-536:

"…the tsunami, in addition to taking so many lives, destroyed a lot of the infrastructure that we would have otherwise been able to use…that we cannot reach with C-130s or by roads, because the road infrastructure has been torn up."



Accessing the Inaccessible

Support Force 536:

“They had 14 Marines there today with shovels who were digging a trench on the beach to drain a four-kilometer-long… pool of water that had been captured inland after the tsunami receded.”

OPERATIONAL DELAYS
Diminished / Unimproved Ports are the NORM during Third World Operations

Expeditionary Capabilities

Supporting movement across estuaries, mud flats, shallow coastal beaches, deminished ports, and In-Land water ways

JETA SPOD
Joint Enable Theater Access Sea Ports Of Debarkation

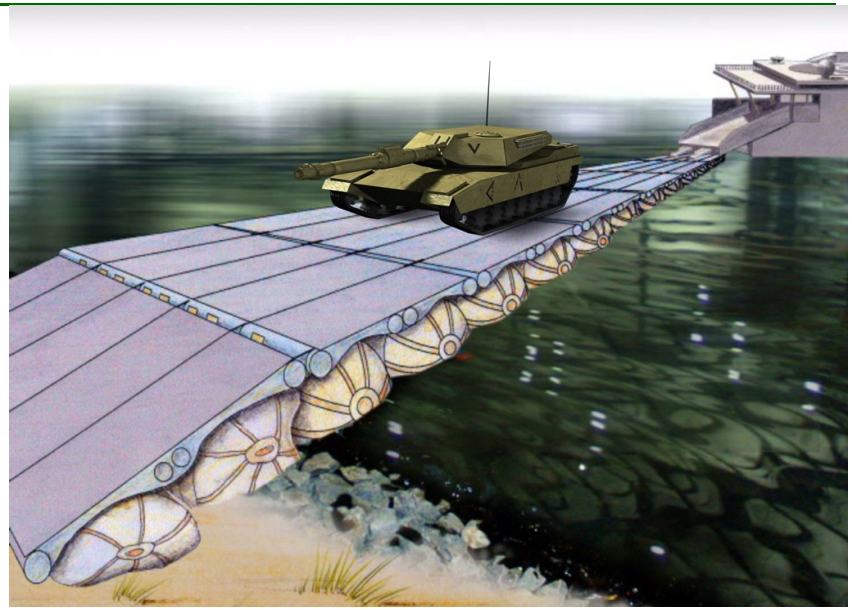
FY 06 ACTD Candidate

Accessing the Inaccessible

JETA SPOD
Joint Enable Theater Access Sea Ports Of Debarkation

FY 06 ACTD Candidate

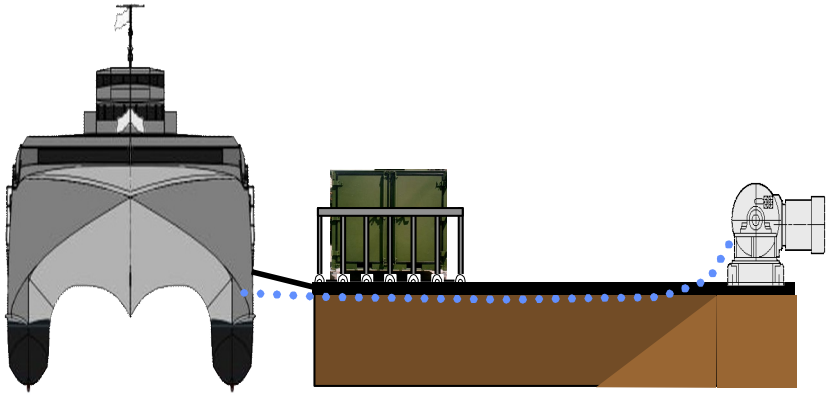
<u>Problem</u>: Existing technologies cannot rapidly transition forces across shallow water coastal beachheads, austere in-land water ways, or successfully transition equipment across diminished beaches or ports utilizing existing logistical or engineering assets.



<u>Situation</u> – Current tactical and humanitarian operations demonstrated a significant capability shortfall to successfully deploy personnel and equipment across shallow water beaches, unimproved or severely diminished ports, flooded/debris fields, and various inland waterways: rivers, mud flats, swamps, and estuaries.

* Existing bridging and causeway systems lack the means to rapidly discharge, deploy within shallow water conditions, support waterways without direct open ocean access or significant logistical support.

* Existing assets do not support equipment discharge from the Joint High Speed Connector or Tactical Support Vessel and often require



Causeway Sections

--- NLS, MCS, INLS ---

all steel barge construction

Potential Problems consistent with current steel barge employment within austere operational environments

- **Over weight limit for most lift**
- **Outsized for most lift**
- **Restrictive Transportability**
- **Commonly limited to Deep or Open water deployment**
- **Slow to Construct**
- **Manpower Intensive**
- **Limited Freeboard Operability**
- **Limited shallow water access**
- **Limited use within unimproved ports and beaches**
- **Limited in-land water access**
- **Not JHSV compatible**

Restricting Improved Tactical Capability
Historical Sealift Limitations

British Mabey-Johnson

Primary Engineering Capability

Size	Weight Short Tons	Volume Cubic Ft.	Number ISO Containers	Cost per Bridge (FOB UK)
40m	65 Tons (130,000 lbs)	101 M^3 3,600 ft^3	3 – 8x8x40 ft	$175,000 each Freight Cost: $9,000
60m	125 Tons (250,00 lbs)	201 M^3 7,200 ft^3	6 – 8x8x40 ft	$345,000 each Freight Costs: $18,000
70m	170 Tons (340,000 lbs)	295 M^3 10,500 ft^3	8 – 8x8x40 ft	$465,000 each Freight Costs: $24,000

Notes: 1) Max. Production Rate for estimating purposes = 25 – 40m bridge sets per month

2) Launch set for 70m bridge can be used for 40m and 60m (but not vice versa)

3) Freight costs are $3,000 per 8x8x40 ft container – UK to Kuwait

4) Cost information is provided by MJB, Inc. and is considered confidential and for official us

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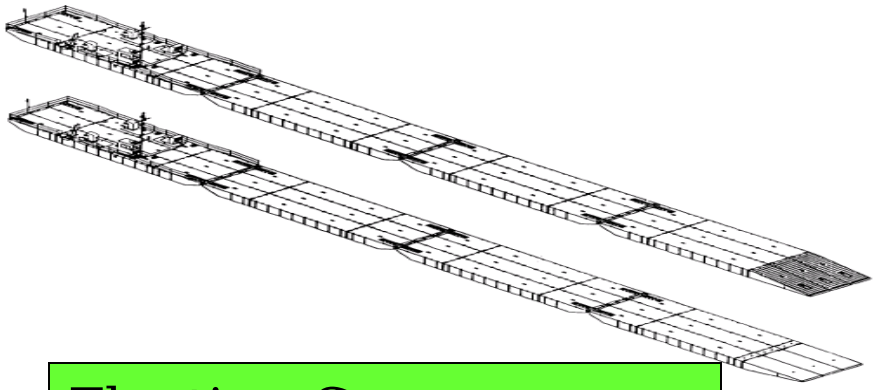
Slide provide courtesy of NFLC/NCD-1

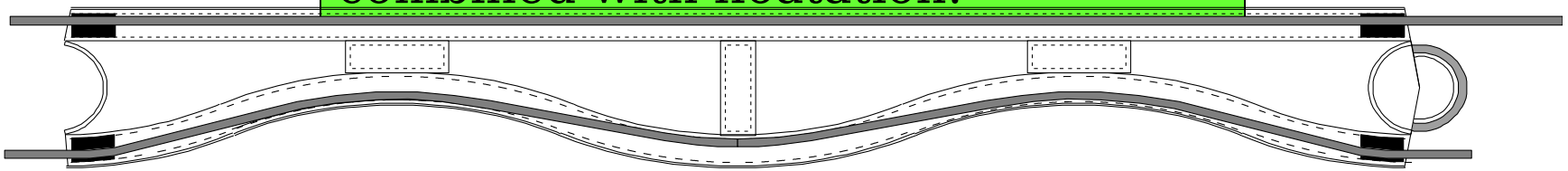
LMCS is a Hybrid of Tactical Fixed Bridging and Floating Causeway



Tactical bridging design concept: Structural stiffness supports entire load between fixed supports

Floating Causeway Design Concept: Local buoyancy supports all loads

LMCS - Solves coupled equation for Optimal Structural Stiffness combined with floatation:



Design Comparison: Fixed Steel and Pneumatic Causeway

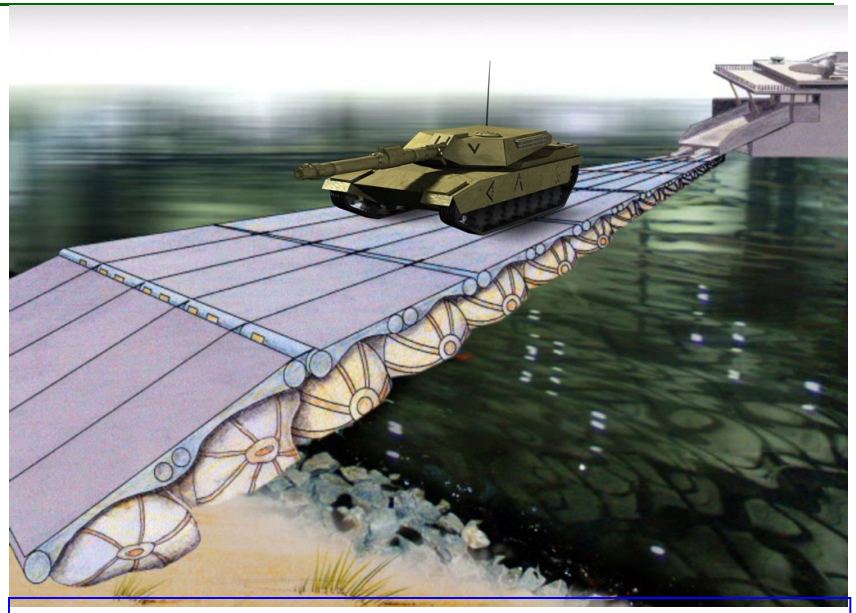
	Fixed Steel	Pneumatic
Volume	**Stowed size must be sufficient to float causeway elements plus load**	**Stowed size must be sufficient to float causeway element only**
Strength/Weight	**Deck load must be conveyed to sides and bottom** **- requires thick deck/internal bracing** **- more freeboard means significantly more weight** **- Rigid design susceptible to critical damage**	**Deck load is supported on top of pneumatic tube** **- greatly reduced deck thickness** **- more freeboard without significantly increased weight** **- Design less susceptible to critical damage**
Draft	**Fixed weight/volume means relatively large draft for beaching large capacity causeway elements**	**- Reduced volume during deployment means less draft for beaching large capacity causeway elements** **- Adjustable operational load and depth**

Lightweight Modular Causeway System (J ETA-LMCS)

FY 06 ACTD Candidate

LMCS SPECIFICATIONS

- Technical Readiness Level of Maturity = **6**
- **60’ x 20’** section deployed within **20’ TEU**
- Deployable from either water to the high water mark, from the high water mark, out
- Operational **Crew Size: 6**
- Time for Operational Deployment: **3 hours**
- Standard spanning capability: 20m per TEU
- **Draft: 12 inch minimal** with **MLC 70**
- Easily deployable to in-land water ways via DOD organic overland and air transport
- **Only JHSC/TSV deployable system**

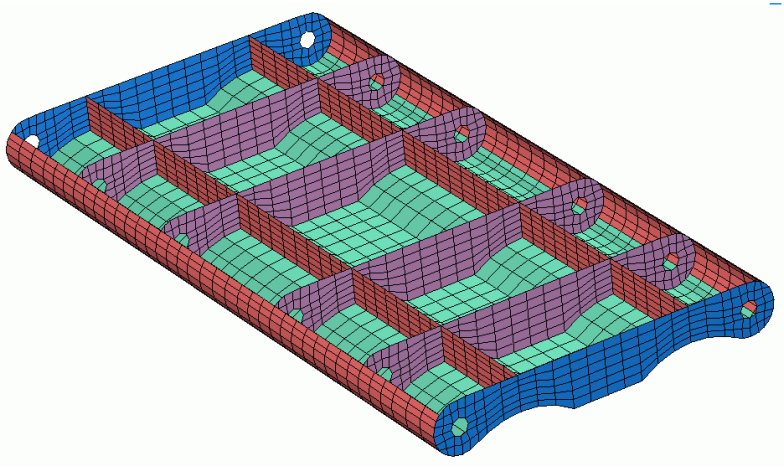


- Recent Tsunami support efforts experienced critical distribution shortfalls due to the destruction of road ways and operable ports. **No existing system could readily be deployed** that could successfully access the devastated beaches or gap the newly formed land bridges. **(AIR, HST, Overland, Ashore-**

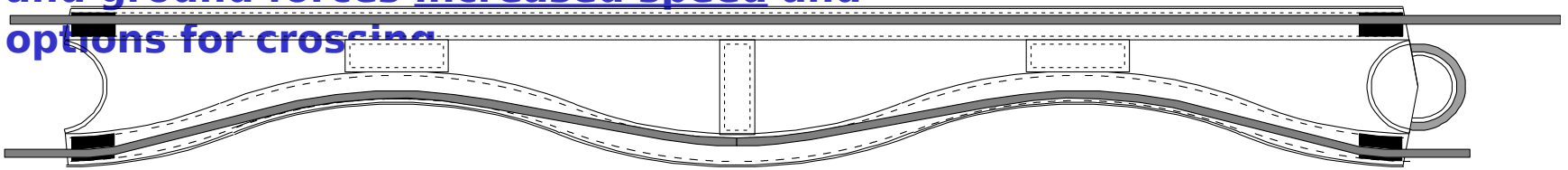
Joint Enable Theater Access – Lightweight Modular Causeway System (J ETA-LMCS)

FY 06 ACTD Candid

- The LMCS system permits deployment into in-land waterways not accessible to sea based assets or to craft with draft requirements exceeding 12 inches.
- The LMCS system provides a new capability to utilize austere shorelines and waterways with soil conditions insufficiently stable to support the weights of traditional crossing systems (bridge piles, rock fill, etc).
- LMCS is deployed in hours vice days with minimal manpower allowing contingency planners greater flexibility and ground forces increased speed and options for crossing



LMCS Structural Const



LMCS Structural Section

Lightweight Modular Causeway System (J ETA-LMCS)

KEY ATTRIBUTES / APPLICATIONS:

FY 06 ACTD Candidate

- Ideally suited to bridge large **mud flat** or **tidal estuary barriers** or create an expedient ramp in support of water borne onload/offload efforts in a rapid fashion.
- Well suited to address **diminished infrastructure** of humanitarian contingencies such as the current tsunami relief effort.
- Greatly **enhances JHSV capabilities** by expanding and simplifying off load capabilities, becoming **operationally independent** of commercial support.
- **Low weight and cube** when 'packed' easily provides transitional capability included within existing Maritime Propositioned Force (MPF) manifest.
- **Minimal operational requirements and constraints** enable employment as an organic Engineer or MAGTF Expeditionary Unit (MEU) asset.
- Low manpower / logistical requirements to deploy and re-deploy reduces operational footprint.
- **Quickly deployed** providing increased tactical and cargo throughput capability.
- Weight capacity sufficient to support all tactical and contingency

Joint Enable Theater Access
Lightweight Modular Causeway System (JETA-LMCS)

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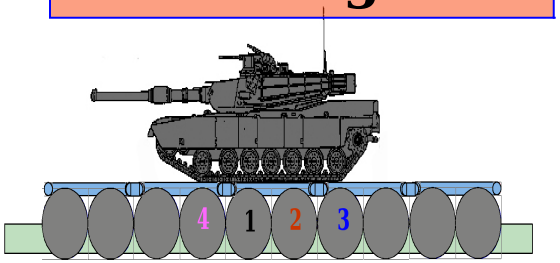
Risk Mitigation

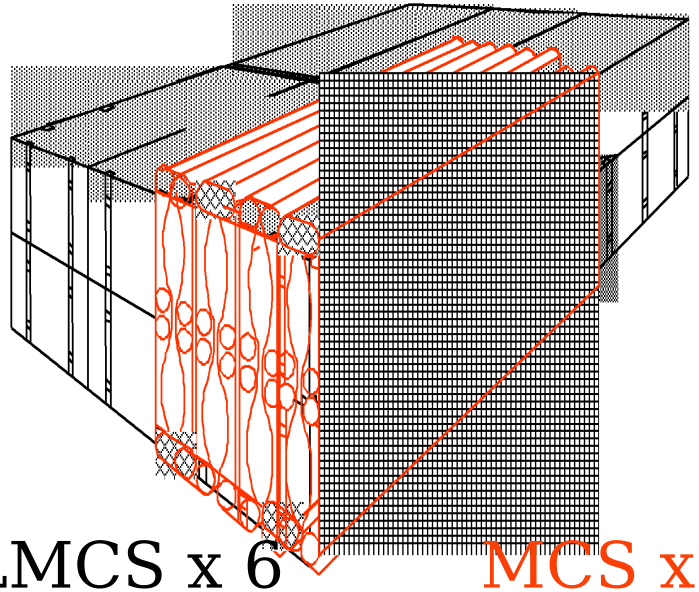


- Design provides several minutes of operability prior to failure due to punctures
- Retains operable buoyancy with loss of 4 tubes
- Massive failure would result in instantaneous loss of floatation

❖ Operable Safeguards against system failure:

- ➢Minimum freeboard is still positive for up to 4 adjacent tube failures (pictured above)
- ➢Includes internal redundancy – extra air bladder for each tube
- ➢Design retains positive freeboard supporting M1A with 3 adjacent tubes deflated

DEPLOYABILITY
LMCS comparison to with MCS



LMCS x 6 MCS x 1/6

LMCS to save 70% in weight and volume retaining 100% payload capacity compared to MCS equivalent.

Lightweight Modular Causeway System (JETA-LMCS)

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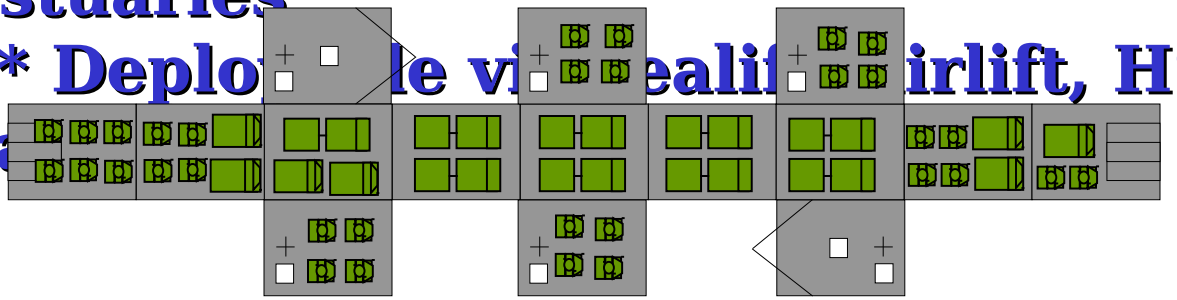
Likely future applications:

* Expedient river-crossing
* Provides shallow water bridging 'connector' to augment other systems capability gaps (INLS, MLS, Maybe Johnson)
* In-land waterway deployment, gap crossing
* Expedient ramp systems extended from shore across mudflats, shallow reefs, and estuaries
* Deplo[illegible]le vi[illegible]ealif[illegible]irlift, HST, and Overla[illegible]



Comparative Review of Current System Capab

Bridging System Solutions	Load capacity (tons)	Spanning Capacity @ MLC 70	Deployment Time	Relocatable	Cubes Undeployed CM	Unit Weight Undeployed (tons)	Foundation support requirements w MLC 70	Transportable to inland water bodies	Substraight independant	Able to span long distances over substraights w virtually no pint load bearing capacity	Commercially available	Inherently limited military/ commercial	Compatible w Army/Navy tactical	Highway/ cross country
LMCS	70	20 M / Section Container (4)	3 Hours / Section (7)	Yes	48	7	1 ft draft	Yes (5)	Yes	Yes	No	Low	Yes	Moderate
LCAC	60	60 NM		Yes	n/a	n/a	None	No	Yes	Yes	No	Yes	Yes	Yes
MaybeyJohnson Bridging	70 / 80 (3)	15-60 M	10 CH / 260 MH (8)	Difficult	360	69	Load Bearing Soil Conditions	Moderate (6)	Partially	No	Yes	No	Yes	Yes
Floating Maybey Johnson / Causeway Bridging / Floating Ribbon Bridging	70+	70 - 500 M	Long (9)	Yes w/ Difficulty			6 ft draft	No	Yes	Yes	Yes	No	Yes	Yes
MBG Bridging	70 (1)	46 M		Yes w/ Difficulty			Load Bearing Soil Conditions	Moderate (5)	No	No	Yes	No	Yes	Yes
Bailey Bridge	70 (2)	55 M	34 CH / 150 MH	Yes w/ Difficulty		96	Load Bearing Soil Conditions	Moderate (6)	No	No	Yes	No	Yes	Yes

	a	Does not meet mission requirements	1	Load capacity is highly dependant on bridge span. MLC70 is attainable to a span of 46 M max.
	b	Partially meets mission requirements	2	Load capacity is highly dependant on bridge span. MLC70 is attainable to a span of 55 M max.
	c	Meets mission requirements	3	Load capacity is highly dependant on bridge span. MLC70 is attainable to a span of 40 M max. LSB version at 40 M can carry up to MLC 80
			4	Each section is transported via 20' ISO Flat Rack (9x9x20).
			5	Deployable by Air or Truck
			6	Deployable by Truck only

7	Per 60 foot section.		
8	10 Crew Hours based on a 26 Man crew working 10 shift. Excludes foundation work.		
9	Deployable via water only		

Metrics

Parameters	Baseline	Threshold	Objective
SPOD Planning Tools – % of worldwide small ports covered by throughput prediction information tool (PACE)	Near zero	50%	80%
Causeway Weight	MCS	↓50%	↓65%
Causeway Volume	MCS	↓50%	↓65%
JHSV Deployability – Organic assets only	No (MCS, INLS)	Yes	Yes
Emplacement Time – 120-foot causeway	2-5 days	12 hours	6 hours
Container Throughput	RTCH	↑200%	↑400%

Lightweight Modular Causeway System (J ETA-LMCS)

FY 06 ACTD Candidate

Comparative evaluation for use over estuaries, mud flats, shallow beach access, and in-land water access (rivers, lakes, lagoons, swamps, and marshlands):

Systems Available:	Key Feasibility Issues
•LMCS (+)	Fulfills expeditionary capability gaps Requires operable testing / evaluation
•LCAC (+/-)	Fulfills most mission requirements Limited wetland / land bridge capability
•Floating Maybe Johnson (-)	Fulfills select mission requirements
•Medium Girder Bridge (-)	Fulfills select mission requirements
•Bailey Bridge (-)	Fulfills select mission requirements
•Floating Ribbon Bridge (-)	Fulfills select mission requirements

Todays Capability Gaps

Thousands of lives were lost
less than 5 kilometers of established